

Appl. No. 10/045,190
Amdt. dated September 18, 2003
Reply to Office Action of June 20, 2003

REMARKS/ARGUMENTS

Claim Rejections - 35 USC § 102

The Examiner has rejected claims 1-4 and 7 as being anticipated by U.S. Patent No. 5,218,652 of Lutz. It is respectfully submitted that this rejection is improper because Lutz does not use a polarization beam splitter in his depolarizer.

There is a big difference between the polarization beam splitter used in the all-fiber depolarizer of the present invention and the splitter or coupler 10 used by Lutz. These are totally different components. Lutz uses a coupler as a splitter that splits the light from one input port into two output ports, whatever the state of polarization. The coupler of Lutz can be made with or without polarization maintaining fiber, but in all cases, it remains a device that merely splits the light.

As the present applicants have indicated in the specification of the present application (c.f. page 4, lines 18-20), in the Lutz patent, the idea is to use a polarization preserving coupler to split the light and a birefringent fiber to preserve the polarization in the recirculating loop.

Contrary to what is stated by the Examiner, the loop 28 shown in Fig. 1 of Lutz cannot be made of standard single-mode, non-birefringent fiber. As disclosed in the preferred embodiment of the Lutz patent (c.f. column 2, lines 36-58) both the coupler 10 and the loop 28 use polarization-maintaining or birefringent fibers.

However, in the alternative embodiment disclosed by Lutz (c.f. column 3, lines 48-57), where coupler 10 is made of non polarization-maintaining fiber, instead of loop 28, such depolarizer has a different polarization shifting device installed therein (c.f. column 3, lines 56-57), which is shown in Fig. 2. This shifting device of Lutz is not comparable to the loop made of a standard non-birefringent fiber claimed in claim 1 of the present application.

Thus, the basic distinction between Lutz and the present invention is that the polarization beam splitter is a completely different device than the coupler 10 of Lutz. The function of the

polarization beam splitter is to separate the light into two orthogonal states of polarization. This is indicated, for example, on page 8, lines 17-21, wherein is stated:

“The polarization of the signal entering the polarization beam splitter must be either circular or linear, but at an angle of essentially 45° from the polarization axis of the polarization beam splitter. This causes the signal to be split into two orthogonal, equally powered, optical signals, one in each output port of the polarization beam splitter”.

In order to make this entirely clear, claim 1 has been amended to include the indication of the effect of the polarization beam splitter, as disclosed above.

It should also be noted that the polarization beam splitter of the present invention can act as a polarization combiner when used in the reverse direction, combining two orthogonal states of polarization from two different fibers into a single fiber. This is disclosed on page 16, lines 9-21 and page 17, lines 10-15 and new claim 13 has been added to cover this feature. The coupler of Lutz has no such ability and if used in reverse, it would always merely split the light.

It is therefore submitted that claim 1, as amended, is not anticipated by Lutz who deals with a different type of beam splitter that merely splits the light at any angle, either less than 45° or in the range of 45 to 90° , with the angle of 90° being preferred (c.f. column 2, lines 53-58). This is not at all the same as the present invention which requires an angle of essentially 45° .

Claims 2-3 and 7 being dependent on claim 1, also possess its patentable characteristics.

Regarding claim 4, applicants disagree with the Examiner that the invention of Lutz is “identical in all other respects to the claimed invention”. As explained above, the invention of Lutz is very different in its structure and effect from the present invention, and there is no indication whatsoever that the invention of Lutz could encompass a broadband polarization beam splitter, since it does not include any polarization beam splitter.

Claim Rejection - 35 USC § 103

The rejection of claim 5 as being obvious over Lutz is unjustified and is respectfully traversed. It is not at all obvious for one of ordinary skill in the art to use a Mach-Zehnder structure for a broadband polarization splitter used as a polarization beam splitter. It may be obvious to use a Mach-Zehnder structure as a simple splitter such as used by Lutz, but certainly not as a polarization beam splitter as explained above. The present applicants were the first to discover this concept of using an all-fiber Mach-Zehnder structure as a polarization beam splitter as defined in claim 5 and they should be entitled to this claim.

It is also submitted that claim 10 is not obvious over Lutz who merely indicates that the length of the fiber in loop 28 is preferably greater than the coherence length of the light source (c.f. column 2, lines 59-60). First, this means that it is not absolutely required and that it could actually be less than the coherence length of the light source, and second it relates to a loop made of birefringent or polarization-maintaining fiber as explained above. Under these circumstances, it could hardly be obvious that a loop made of non-birefringent fiber should be several times the coherence length of the light source.

The rejection of claims 11-12 as obvious over Lutz combined with U.S. Patent No. 5,933,555 of Shen is also respectfully traversed.

Both Lutz and Shen have been discussed in the present specification. As pointed out above, Lutz discloses a different type of depolarizer using a different type of splitter and loop. Shen uses a plurality of concatenated depolarizers and loops, but for a totally different purpose than set forth in claim 11 where a primary polarization beam splitter is used as the control means in the arrangement claimed in claim 1. This is neither disclosed nor suggested by Shen. Unlike Shen, the present applicants do not claim in claim 11 a plurality of depolarizers such as 38, 40 etc., but rather only one depolarizer having an additional (primary) polarization beam splitter as control means. It is therefore a clearly different concept. Claim 12 is dependent on claim 11 and possesses its patentable characteristics.

The indication by the Examiner that claims 6, 8 and 9 are allowable has been noted.

In view of the above amendments and remarks, it is believed that this application is now in condition for allowance and a favorable action is accordingly solicited.

The Examiner is invited to call applicants' agent if any questions remain following review of this response.

Respectfully submitted,



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